This printout indicates that an impulse originating from the load, of +2Ø57 volts peak and an area of Ø.Ø156V-Sec, occurred at the time shown. If the direction had been from the source, SRCE would be printed in place of LOAD in the example.

B.8 PRINTOUT MODES

Printout modes and calibration signals remain the same as in the standard 6ØØ1 described in paragraph 2.6.

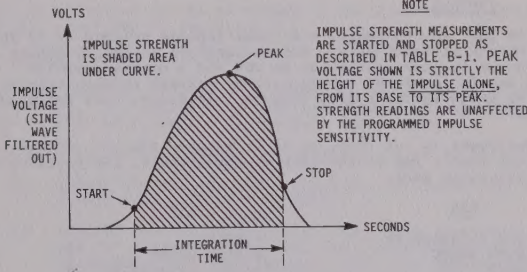
VOLTS
IMPULSE STRENGTH IS SHADED AREA UNDER CURVE.
PEAK
IMPULSE VOLTAGE (SINE WAVE FILTERED OUT)
START
STOP
SECONDS
INTEGRATION TIME
NOTE
IMPULSE STRENGTH MEASUREMENTS ARE STARTED AND STOPPED AS DESCRIBED IN TABLE B-1. PEAK VOLTAGE SHOWN IS STRICTLY THE HEIGHT OF THE IMPULSE ALONE, FROM ITS BASE TO ITS PEAK. STRENGTH READINGS ARE UNAFFECTED BY THE PROGRAMMED IMPULSE SENSITIVITY.

Figure B-1. Impulse Strength Measurement

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1001329

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626

```
IMPULSE SENS     0100V
FREQ SENS        005Hz
VOLTAGE SENS     002V
V LOW LIMIT      105V
V HIGH LIMIT     125V
RANGE F.S.       200V
   626-PA-6001R2
        CH1
11/17/83    13:55:30
  PROGRAM SUMMARY
```

626A

```
  PROGRAM SUMMARY
11/17/83    13:55:30
        CH1
   626-PA-6001R2
RANGE F.S.       200V
V HIGH LIMIT     125V
V LOW LIMIT      105V
VOLTAGE SENS     002V
FREQ SENS        005 HZ
IMPULSE SENS     0100V
```

IMPULSE

When used with the 200V FS range, a minimum impulse voltage of 50 Vpk is required to obtain strength data. For information on the direction of origin, a minimum impulse voltage of 50 Vpk and a minimum impulse current of 1 Amp is required. These minimum voltage levels increase with range, as shown in Table B-1, but the minimum current required is not affected.

If the current probe is not used, or if it is used but the impulse current is less than 1 Amp at the time of measurement, the printout will take on the following form:

626

```
4 IMP 12:34:56.88
0.0156 V-SEC
+2057V
```

626A

```
+2057V
0.0156 V-SEC
4 IMP 12:34:56.88
```

This printout indicates that an impulse which deviated from the normal line voltage with a strength of 0.0156V-Sec and a peak voltage of 2057 volts was detected on channel 4 at the time shown. The "+" preceding the impulse voltage indicates that the impulse was positive with respect to the "-" or neutral terminal on the 6001 rear panel.

Figure B-1 illustrates an impulse strength measurement.

IMPULSE WITH DIRECTION

When the current probe is used and the impulse current is greater than 1 Amp at the time of measurement, the printout will take the following form:

626

```
4 IMP 12:34:57.00
0.0156 V-SEC
+2057V, LOAD
```

626A

```
+2057V, LOAD
0.0156 V-SEC
4 IMP 12:34:57.00
```

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Table B-1. 626-PA-6001 Option 102 Technical Specifications (Cont'd)

IMPULSE DIRECTION OF ORIGIN	
Minimum Impulse Current:	1 Amp for 0.1 uSec before and after measurement.
Minimum Impulse Voltages:	50 Vpk on 200 Vrms Range 100 Vpk on 400 Vrms Range 200 Vpk on 600 Vrms Range

B.4 INSTALLATION IN MAINFRAME

The module is installed in the mainframe in the same manner as the standard 6001 described in paragraph 2.1.

B.5 CONNECTIONS TO THE MODULE

Connecting the 6001 to the line to be monitored is the same as described in paragraph 2.2. If impulse direction information is required, the current probe must be connected in the following manner.

a.) Turn off AC power to the line that is to be monitored.

b.) Attach the current probe connector to its mating connector on the rear panel of the 6001.

c.) Install current probe on the line which is connected to the "+" voltage terminal of the corresponding channel, being sure that the LOAD and SOURCE markings on the probe are oriented such that SOURCE is toward incoming power. Proper connections are shown in Figure A-1.

d.) Reapply AC power.

Note: Printouts of impulse direction of origin will correlate with the orientation of the LOAD and SOURCE markings on the current probe.

B.6 OPERATING THE 6001 WITH OPTION 102

Operation of the 6001 with Option 102 requires no additional programming steps; programming is the same as described in paragraph 2.3.3.

B.7 DESCRIPTION OF DATA PRINTOUTS

The only printouts affected by the addition of Option 102 are those for module identification and impulse data.

PROGRAM SUMMARY

When the Program Summary key (designated "PROG" is depressed, the module will be identified as a 626-PA-6001R2 as in the following example.

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APPENDIX B. IMPULSE STRENGTH/DIRECTION OPTION, OPTION 102 FOR 626-PA-6001 PLUG-IN (NOT COMPATIBLE WITH OPTION 101)

B.1 INTRODUCTION

The following paragraphs describe the differences between the 6001 plug-in with Option 102 and the standard 6001 plug-in.

NOTE

The following data supersedes that found in Sections I thru III unless otherwise stated.

B.2 PURPOSE

Option 102 has no effect on the line frequency measurements of the 6001 previously described. It also does not affect the measurement of impulse polarity and peak voltage. Option 102 is designed to provide information on impulse strength. In addition, if the current probe is used, direction of origin will be determined for impulses having a current of 1 Amp or greater at the time of measurement.

B.3 EQUIPMENT CHARACTERISTICS

Technical specifications for Option 102 are listed in Table B-1. All specifications for the 6001, listed in Table B-1, still apply.

Table B-1. 626-PA-6001 Option 102 Technical Specifications

IMPULSE STRENGTH

Ranges:

200V F.S. Range	0.0002 to 0.2046 V-Sec
400V F.S. Range	0.0004 to 0.4092 V-Sec
600V F.S. Range	0.0008 to 0.8184 V-Sec

Accuracy: ±10% of reading, ±0.1% of F.S. for 1/2 sinewave pulses up to 100 uSec duration greater than 100 Vpk*. Typically -20% at 200 uSec, -50% at 500 uSec.

* 100 Vpk on 200V F.S. Range
200 Vpk on 400V F.S. Range
400 Vpk on 600V F.S. Range

Timing Reference Points: Start at 25V** - stop at 30% of Vpk.

** 25V on 200 Vrms Range
50V on 400 Vrms Range
100V on 600 Vrms Range

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IMPULSE WITH DIRECTION

When the current probe is used and the impulse current is greater than 1 Amp at the time of measurement, the printout will take the following form:

	626	626A	
↑	4 IMP 12:34:57.00 +2057V, LOAD, 089uS	+2057V, LOAD, 089uS 4 IMP 12:34:57.00	↓

This printout indicates that an impulse originating from the load, of +2057 volts peak and 89 microseconds in duration, occurred at the time shown. If the direction had been from the source, SRCE would be printed in place of LOAD in the example.

Figure A-2 illustrates an impulse duration measurement.

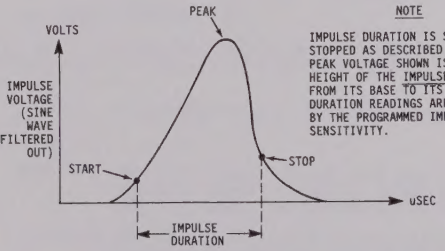
PEAK
VOLTS
IMPULSE VOLTAGE (SINE WAVE FILTERED OUT)
START
STOP
uSEC
IMPULSE DURATION
NOTE
IMPULSE DURATION IS STARTED AND STOPPED AS DESCRIBED IN TABLE A-1. PEAK VOLTAGE SHOWN IS STRICTLY THE HEIGHT OF THE IMPULSE ALONE, FROM ITS BASE TO ITS PEAK. DURATION READINGS ARE UNAFFECTED BY THE PROGRAMMED IMPULSE SENSITIVITY.

Figure A-2. Impulse Duration Measurement

A.8 PRINTOUT MODES

Printout modes and calibration signals remain the same as in the standard 6001 described in paragraph 2.6.

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A.7 DESCRIPTION OF DATA PRINTOUTS

The only printouts affected by the addition of Option 101 are those for module identification and impulse data.

PROGRAM SUMMARY

When the Program Summary key (designated "PROG") is depressed, the module will be identified as a 626-PA-6001R1 as in the following example.

626	626A
IMPULSE SENS 0100V	PROGRAM SUMMARY
FREQ SENS 00.5Hz	11/17/83 13:43:25
VOLTAGE SENS 002V	CH1
V LOW LIMIT 105V	626-PA-6001R1
V HIGH LIMIT 125V	RANGE F.S. 200V
RANGE F.S. 200V	V HIGH LIMIT 125V
626-PA-6001R1	V LOW LIMIT 105V
CH1	VOLTAGE SENS 002V
11/17/83 13:43:25	FREQ SENS 00.5HZ
PROGRAM SUMMARY	IMPULSE SENS 0100V

IMPULSE

When used with the 200V FS range, a minimum impulse voltage of 50 Vpk is required to obtain duration data. For information on the direction of origin, a minimum impulse voltage of 50 Vpk and a minimum impulse current of 1 Amp is required. These minimum voltage levels increase with range, as shown in Table A-1, but the minimum current required is not affected.

If the current probe is not used, or if it is used but the impulse current is less than 1 Amp at the time of measurement, the printout will take on the following form:

626	626A
4 IMP 12:34:56.88	+2057V, 089uS
+2057V, 089uS	4 IMP 12:34:56.88

This printout indicates that an impulse which deviated from the normal line voltage for 89 microseconds with a peak voltage of 2057 volts was detected on channel 4 at the time shown. The "+" preceding the impulse voltage indicates that the impulse was positive with respect to the "-" or neutral terminal on the 6001 rear panel.

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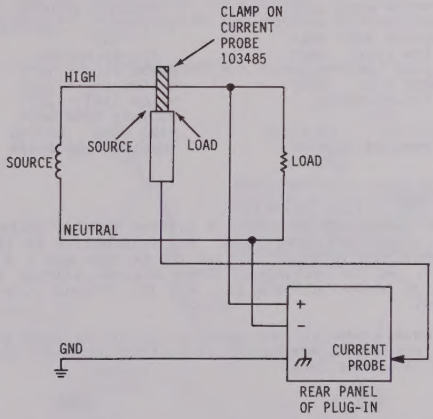

Figure A-1. Proper Connections of 626-PA-6001 for Use with Current Probe

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Table A-1. 626-PA-6001 Option 101 Technical Specifications (Cont'd.)

Minimum Impulse Voltage:	50 Vpk on 200 Vrms Range 100 Vpk on 400 Vrms Range 200 Vpk on 600 Vrms Range

IMPULSE DIRECTION OF ORIGIN

Minimum Impulse Current:	1 Amp for 0.1 uSec before and after measurement
Minimum Impulse Voltages:	50 Vpk on 200 Vrms Range 100 Vpk on 400 Vrms Range 200 Vpk on 600 Vrms Range

---

A.4 INSTALLATION IN MAINFRAME

The module is installed in the mainframe in the same manner as the standard 6001 (par. 2.1).

A.5 CONNECTIONS TO THE MODULE

Connecting the 6001 to the line to be monitored is the same as described in paragraph 2.2. If impulse direction information is required, the current probe must be connected in the following manner:

a.) Turn off AC power to the line that is to be monitored.

b.) Attach the current probe connector to its mating connector on the rear panel of the 6001.

c.) Install current probe on the line which is connected to the "+" voltage terminal of the corresponding channel, being sure that the LOAD and SOURCE markings on the probe are oriented such that SOURCE is toward incoming power. Proper connections are shown in Figure A-1.

d.) Reapply AC power.

Note: Printouts of impulse direction of origin will correlate with the orientation of the LOAD and SOURCE markings on the current probe.

A.6 OPERATING THE 6001 WITH OPTION 101

Operation of the 6001 with Option 101 requires no additional programming steps. Programming is the same as described in paragraph 2.3.3.

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APPENDIX A. IMPULSE DURATION/DIRECTION OPTION, OPTION 101 FOR 626-PA-6001 PLUG-IN (NOT COMPATIBLE WITH OPTION 102)

A.1 INTRODUCTION

The following paragraphs describe the differences between the 6001 plug-in with Option 101 and the standard 6001 plug-in.

NOTE

The following data supersedes that found in previous paragraphs of this manual unless otherwise stated.

A.2 PURPOSE

Option 101 has no effect on the line frequency measurements of the 6001 described in previous paragraphs. It also does not affect the measurement of impulse polarity and peak voltage. Option 101 is designed to provide information on impulse duration. In addition, if the current probe is used, direction of origin will be determined for impulses having a current of 1 Amp or greater at the time of measurement.

A.3 EQUIPMENT CHARACTERISTICS

Technical specifications for Option 101 are listed in Table A-1. All specifications for the 6001, listed in Table 1-1, still apply.

Table A-1. 626-PA-6001 Option 101 Technical Specifications

IMPULSE DURATION

Range: 1 uSec to 1023 uSec

Accuracy: ±6% of reading ±0.3% F.S. for 1/2 sinewave pulses up to 100 uSec duration greater than 100 Vpk.*

Typically
-10% at 200 uSec, -20% at 400 uSec, -50% at 1000 uSec.

* 100 Vpk on 200 Vrms Range
200 Vpk on 400 Vrms Range
400 Vpk on 600 Vrms Range

Timing Reference Points: Start at 25V** - stop at 30% of Vpk.

** 25V on 200 Vrms Range
50V on 400 Vrms Range
100V on 600 Vrms Range

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SECTION III

OPERATIONAL TEST

3.1 GENERAL

This section provides information for performing an operational test to verify that the 6001 plug-in is operating properly.

3.2 SYSTEM CHECK

When the PRINTOUT MODE switch is set to SYSTEM CHECK, a source of precise signals is applied to the front end circuitry of the 6001. Any inputs that are connected at this time will be automatically disconnected for the system check period. These signals fully verify the operational integrity of the module. A typical system check printout, as well as the system check signals and the allowable tolerance levels are shown below.

626

```
******************
PRESENT F 059.7 HZ
PRESENT V 119.6 V
IMP   + 0160 V PK
   626-PA-6001
       CH 5

TIME = 00:00:12.26
***SYSTEM CHECK***
```

626A

```
***SYSTEM CHECK***
TIME = 00:00:12.26

       CH 5
   626-PA-6001
IMP   + 0160 V PK
PRESENT V 119.6 V
PRESENT F 059.7 HZ
******************
```

3.3 SYSTEM CHECK SIGNALS

Impulse:	+160V pk
Voltage:	120.0 Vrms
Frequency:	
626-PA-6001 -1,2	60 Hz
626-PA-6001 -3,4	50 Hz

3.4 SYSTEM CHECK TOLERANCES

F.S. RANGE	IMPULSE	VOLTAGE	FREQUENCY
200	+134 to +186 Vpk	118.4 to 121.6V	48.8 to 50.2 Hz 59.8 to 60.2 Hz
400	+124 to +196 Vpk	118.0 to 122.0V	49.8 to 50.2 Hz 59.8 to 60.2 Hz
600	+114 to +206 Vpk	117.6 to 122.4V	49.8 to 50.2 Hz 59.8 to 60.2 Hz

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The following printout illustrates voltage sag (fig. 2-3) in the MAXIMUM TAIL mode.

626

```
1  INC   12:27:48.86
   112.1  V

1  INC   12:17:48.69
   110.0  V

1  INC   12:17:48.62
   108.1  V

1  INC   12:17:48.61
   105.9

1  NORM  12:17:48.61
   090.1   V  MIN
   SAG  1.25  SEC

1  INC   12:17:48.60
   103.1  V

1  INC   12:17:48.55
   098.0  V

1  INC   12:17:48.05
   096.0  V

1  INC   12:17:47.96
   094.0  V

1  DEC   12:17:47.39
   091.9  V

1  DEC   12:17:47.37
   094.1  V

1  DEC   12:17:47.36
   101.3  V

1  LOW   12:17:47.36

1  DEC   12:17:47.35
   110.8  V

1  INC   12:16:32.15
   113.0  V
```

626A

```
   113.0  V
1  INC   12:16:32.15

   110.8  V
1  DEC   12:17:47.35

1  LOW   12:17:47.36

   101.3  V
1  DEC   12:17:47.36

   094.1  V
1  DEC   12:17:47.37

   091.9  V
1  DEC   12:17:47.39

   094.0  V
1  INC   12:17:47.96

   096.0  V
1  INC   12:17:48.05

   098.0  V
1  INC   12:17:48.55

   103.1  V
1  INC   12:17:48.60

   SAG   1.25  SEC
   090.1   V   MIN
1  NORM  12:17:48.61

   105.9  V
1  INC   12:17:48.61

   108.1  V
1  INC   12:17:48.62

   110.0  V
1  INC   12:17:48.69

   112.1  V
1  INC   12:27:48.86
```


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The first group of generated printouts below illustrates voltage sag (fig. 2-3) in the NORMAL mode. The second group illustrates voltage sag (fig. 2-3) in the OUT-OF-LIMITS ONLY mode.

626

```
1  NOR   12:17:48.61
   Ø9Ø.1  V  MIN
   SAG  1.25 SEC

1  LOW   12:17:47.36


1  NORM  12:17:48.61
   Ø9Ø.1  V  MIN
   SAG  1.25 SEC

1  INC   12:17:48.6Ø
   1Ø3.1  V

1  INC  12:17:48.55
   Ø98.Ø  V

1  INC   12:17:48.Ø5
   Ø96.Ø  V

1  INC   12:17:47.96
   Ø94.Ø  V

1  DEC   12:17:47.39
   Ø91.9  V

1  DEC   12:17:47.37
   Ø94.1  V

1  DEC   12:17:47.36
   1Ø1.3  V

1  LOW   12:17:47.36
```

626A

```
1  LOW    12:17:47.36

   1Ø1.3   V
1  DEC    12:17:47.36

   Ø94.1   V
1  DEC    12:17:47.37

   Ø91.9   V
1  DEC    12:17:47.39

   Ø94.Ø   V
1  INC    12:17:47.96

   Ø96.Ø   V
1  INC    12:17:48.Ø5

   Ø98.Ø   V
1  INC    12:17:48.55

   1Ø3.1   V
1  INC    12:17:48.6Ø

   SAG   1.25 SEC
   Ø9Ø.1   V  MIN
1  NORM   12:17:48.61

1   LOW   12:17:47.36

   SAG  1.25 SEC
   Ø9Ø.1  V  MIN
1  NOR   12:17:48.61
```


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The following is a printout of overvoltage (fig. 2-2) in the MAXIMUM DETAIL mode.

626		626A	
1	DEC 12:56:38.61 119.8 V		119.0 V 1 INC 12:50:12.34
1	DEC 12:56:38.53 121.8 V		121.1 V 1 INC 12:56:34.20
1	DEC 12:56:38.51 124.0 V	1	HIGH 12:56:34.21
1	NORM 12::56:38.51 139.1 V MAX		129.2 V 1 INC 12:56:34.21
1	DEC 12:56:38.50 130.2 V		131.3 V 1 INC 12:56:34.22
1	INC 12:56:35.78 137.3		133.3 V 1 INC 12:56:35:40
1	INC 12:56:35.62 135.3 V		135.3 V 1 INC 12:56:35.62
1	INC 12:56:35.40 133.3 V		137.3 V 1 INC 12:56:35.78
1	INC 12:56:34.22 131.3 V		130.2 V 1 DEC 12:56:38.50
1	INC 12:56:34.21 129.2 V		139.1 V 1 NORM 12:56:38.51
1	HIGH 12:56:34.21		124.0 V 1 DEC 12:56:38.51
1	INC 12:56:34.20 121.1 V		121.8 V 1 DEC 12:56:38.53
1	INC 12:50:12.34 119.0 V		119.8 V 1 DEC 12:56:38.61

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Disturbances which occur while the PRINTOUT MODE switch is in the SUMMARY ONLY position do not generate individual printouts but they are stored in the daily accumulator and are automatically printed each day at midnight (worst case event and number of occurrences in each category). This printout may also be triggered manually by depressing the DATA button.

The first group of generated printouts (below) represent overvoltage conditions (fig. 2-2) in the NORMAL mode. The second illustrates overvoltage (fig. 2-2) in the OUT-OF-LIMITS mode.

626

```
1  NORM  12:56:38.51
   139.1  V  MAX
1  HIGH  12:56:34.21

1  NORM  12:56:38.51
   139.1  V  MAX
1  DEC  12:56:38.50
   130.2  V
1  INC  12:56:35.78
   137.3  V

1  INC  12:56:35.62
   135.3  V

1  INC 12:56:35.40
   133.3  V
1  INC  12:56:34.22
   131.3  V
1  INC  12:56:34.21
   129.2  V
1  HIGH  12:56:34.21
```

626A

```
1  HIGH  12:56:34.21

   129.2  V
1  INC  12:56:34.21

   131.3  V
1  INC  12:56:34.22

    133.3  V
 1  INC  12:56:35.40

   135.3  V
1  INC  12:56:35.62

   137.3  V
1  INC  12:56:35.78

   130.2  V
1  DEC  12:56:38.50

   139.1  V  MAX
1  NORM  12:56:38.51

1  HIGH  12:56:34.21

   139.1  V  MAX
1  NORM  12:56:38.51
```


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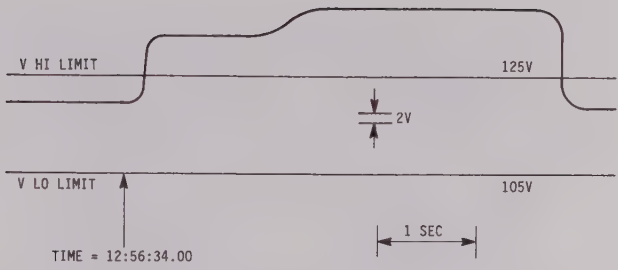

Figure 2-2. Overvoltage Disturbance (6001)

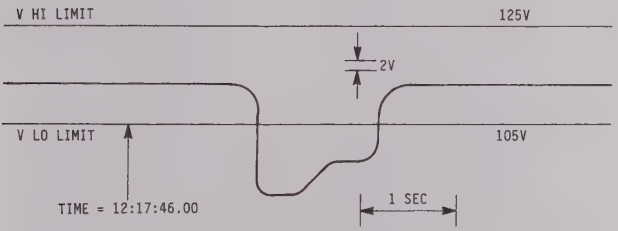

Figure 2-3. Voltage Sag Disturbance (6001)

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The impulse magnitude is measured with respect to the instantaneous point on the power frequency sinewave at which it occurs.

2.5.7 Frequency Change

A frequency change printout is triggered when the line frequency changes more than a preselected amount from the last printed value. The frequency change sensitivity is a user-selected value between 0.2 Hz and 3.0 Hz in 0.1 Hz increments. The following example shows several frequency change printouts.

626	626A
3 FREQ 00:05:12.46 059.0 HZ	060.0 HZ 3 FREQ 00:05:10.44
3 FREQ 00:05:10.64 059.5 HZ	059.5 HZ 3 FREQ 00:05:10.64
3 FREQ 00:05:10.44 060.0 HZ	059.0 HZ 3 FREQ 00:05:12.46

2.6 PRINTOUT MODES

The setting of the PRINTOUT MODE switch on the front panel of the mainframe determines how much detail is printed out. Printout data is reduced as the switch is rotated counterclockwise.

The following printout examples show how various settings of the PRINTOUT MODE switch change the amount of detail in the printed record of a disturbance. It is assumed that the disturbances occurred in Channel 1 and that the limits for Channel 1 were programmed as follows:

RANGE F.S.	200 Vrms
V LOW LIMIT	105 Vrms
V HIGH LIMIT	125 Vrms
V SENSITIVITY	2 Vrms

The example printouts are referenced to figures 2-2 and 2-3 which illustrate overvoltage and voltage sag disturbances, respectively.

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626	626A
2 INC Ø1:Ø2:34.56 115.4 V	115.4 V 2 INC Ø1:Ø2:23.56
2 DEC Ø1:Ø2:34.56 109.2 V	109.2 V 2 DEC Ø1:Ø2:34.56

2.5.4 Voltage Surge

A Voltage Surge is defined as a line voltage which increases through a user-selected upper limit and then returns to an in-tolerance condition in less than 2.56 seconds. When a surge begins, its starting time is printed as follows:

3 HIGH 12:34:50.49

When the line voltage returns to a normal level following a Surge condition, a message such as the following will be printed:

626	626A
3 NORM 12:34:51.59 139.2 V MAX SURGE 1.1Ø SEC	SURGE 1.1Ø SEC 139.2 V MAX 3 NORM 12:34:51.59

n this case, the time at which the voltage returns to normal is shown s well as the maximum voltage reached and the surge duration.

2.5.5 Voltage Sag

A Voltage Sag is defined as a line voltage that decreases below the user-selected lower limit and then returns to an in-tolerance condition in less than 2.56 seconds. Sag printouts take the same form as surge printouts, with the term SAG replacing the term SURGE, and the term MIN replacing the term MAX.

NOTE

Voltage inputs less than 25V RMS will be printed out as Ø.ØV on the 6ØØ1.

2.5.6 Impulses

"Impulse" disturbances represent any line perturbation which contains frequency components in the 3ØØ Hz to 5ØØ kHz range. An impulse type disturbance produces a printout such as the following:

626	626A
2 IMP 1Ø:12:13.45 +Ø139 V PK	+Ø139 V PK 2 IMP 1Ø:12:13.45

This printout indicates that an impulse which deviated from normal line voltage by +139 volts peak was detected on channel 2 at the time shown.

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2.5.1 Overvoltage

An overvoltage condition exists when the monitored power line voltage exceeds the user-specified upper limit for more than 2.55 seconds. The beginning of an overvoltage condition is indicated by a printout such as the following:

```
4   HIGH   12:34:56.78
```

where 4 is the channel number and time is given in hours, minutes and seconds (to .01 sec resolution).

When the line voltage recovers to normal, a printout such as the following occurs:

626			626A		
↑ 4	NORM	12:36:14.56		135.8	V MAX
	135.8	V MAX	4	NORM	12:36:14.56 ↓

indicating when normal voltage was restored and the value of the highest voltage reached during the overvoltage interval.

2.5.2 Undervoltage

An undervoltage condition exists when the monitored power line voltage remains below the user-specified lower limit for more than 2.55 seconds. The beginning of an undervoltage condition is indicated by a printout such as the following:

```
4   LOW   10:09:12.34
```

When the line voltage returns to normal level, a message such as the following is printed:

626			626A		
↑ 4	NORM	10:09:12.34		96.4	V MIN
	96.4	V MIN	4	NORM	10:09:12.34 ↓

indicating when normal voltage was restored and the value of the lowest voltage reached during the undervoltage interval.

2.5.3 Voltage Change

A voltage change printout is triggered when the line voltage changes more than a preselected amount from the last printed value. The voltage change sensitivity is a user-selected integral voltage between one and 15 volts for a 115-volt line. The following example shows several voltage change printouts. The first group shows a voltage increase to 115.4V at the time shown; the second shows a voltage decrease to 109.2V at the time shown.

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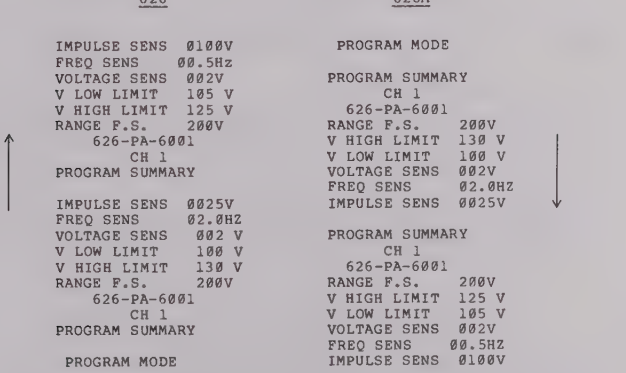
2.4 SELECTING FACTORY/OPTION 103 PRESET PROGRAM

NOTE: Custom Preset Option 103 allows the user to choose his/her own program setup for the PRESET function.

To select the program stored in hard memory, set the FUNCTION switch to PROGRAM and depress the channel number desired. The last operator-set program will be printed out. Now depress the PRESET pushbutton to recall the factory-set program. An example of this sequence appears below. Note that the first program summary printed represents the operator program; the second is the factory program obtained after the PRESET pushbutton is depressed.



2.5 DESCRIPTION OF DATA PRINTOUTS

When any of the disturbances described below is detected by the 6001, it is recorded and displayed in characteristic manner.

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f. When the ENTER indicator goes out, one red indicator above the center bank of pushbuttons lights. This indicates that another function may be programmed.

g. Depress the HI LIMIT pushbutton. Program the high limit value (125) as in step d.

h. When the green ENTER indicator lights, depress the ENTER pushbutton. The programmed high limit value will be echoed back on the printout.

i. Repeat steps f, g and h for the low limit voltage (105V) using the LO LIMIT pushbutton.

j. Repeat steps f, g and h for the voltage sensitivity, using the SENS pushbutton and programming the voltage value as 02.

k. Repeat steps f, g, and h for the frequency sensitivity (0.5Hz), using the F SENS pushbutton and programming the value as 0.5.

l. Repeat steps f, g, and h for the impulse sensitivity (0100 volts), using the IMP SENS pushbutton. The completed program printout should take the following form:

626*		626A*	
IMPULSE SENS	0100V	RANGE F.S.	200V
FREQ SENS	0.5HZ	V HIGH LIMIT	125 V
VOLTAGE SENS	002V	V LOW LIMIT	105 V
V LOW LIMIT	105 V	VOLTAGE SENS	002V
V HIGH LIMIT	125 V	FREQ SENS	0.5HZ
RANGE F.S.	200V	IMPULSE SENS	0100V

NOTE

The instrument is designed to detect an invalid entry and to automatically shift high and low limits if range is changed without reprogramming the limits. If the RANGE value is selected as 200V and the user selects 205V as the low limit value, the printout ENTRY TOO HIGH will appear.

m. When the plug-in program is completed, the user may proceed to program another module (by depressing another channel number) or he may place the instrument on line by setting the FUNCTION switch to OPERATE. While on line, the program in effect may be obtained by simply depressing the PROG pushbutton.

---

*If you are using a Model 626, read (from the bottom up) the "626" printouts in this manual; if you are using a Model 626A, read (from the top down) the "626A" printouts instead.

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Table 2-1. 6001 Plug-In Operating Controls (Cont'd)

Item	Function
DATA pushbutton	When depressed, produces data summary printout.
PRESET pushbutton	With FUNCTION switch set to PROGRAM and a channel pushbutton (1-5) depressed, depressing PRESET recalls non-volatile factory program for that channel. Only valid when range indicator is lit.

2.3.3 Programming Procedure

Assume it is desired to program a full scale range of 200V, a high limit of 125V, a low limit of 105V, voltage sensitivity of 2 volts, frequency sensitivity of 0.5 Hz and an impulse sensitivity of 100V. Voltage and frequency sensitivity sets the deviation from the present value above or below which a detected value produces a recorded disturbance.

For impulse measurements, the sensitivity corresponds to the absolute threshold, so that for an impulse sensitivity of 100 volts, a disturbance is recorded when impulse amplitude is greater than or equal to 100 volts.

For the example cited, program the 6001 as follows:

a. Set FUNCTION switch to PROGRAM.

b. Depress the channel pushbutton (1-5) that corresponds to the slot position of the plug-in to be programmed. Note that a program summary for that channel is immediately printed.

c. Note that the red indicator next to the RANGE pushbutton lights. Depress the RANGE pushbutton. The printer prompts:

Enter one of three ranges: 200, 400, or 600V F.S.

d. Note that three yellow indicators above the numeric keyboard now light. Enter 200, using the keyboard. This selects the first range (20-200 VAC) of the plug-in. As each digit is entered, one indicator goes out. If an error is made, depress CLEAR ENTRY and correct the entry.

e. When the RANGE value has been programmed, the green indicator next to the ENTER pushbutton lights. Depress this pushbutton to enter the value. The RANGE entry (RANGE F.S. 200V) will now be echoed back on the printout.

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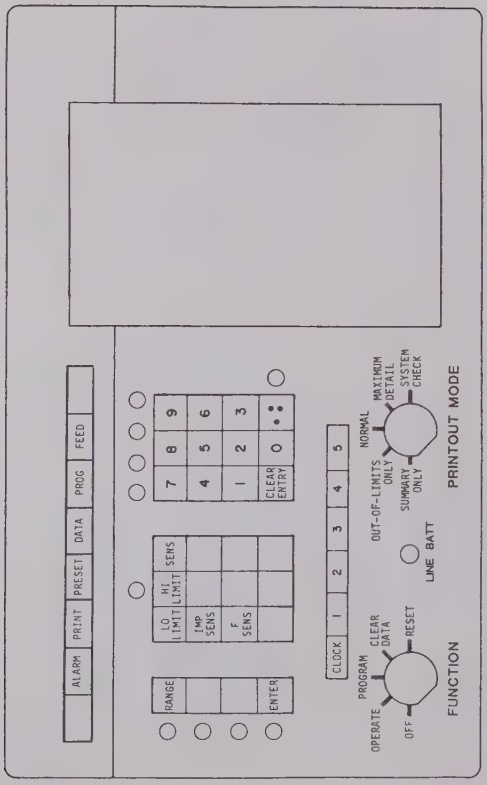

Figure 2-1. Series 626 Controls Used by the 6001 Plug-In

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2.3 OPERATING THE 6001

2.3.1 Operating Controls and Indicators

The functions of the mainframe operating controls and indicators associated with 6001 plug-in operation are described in Table 2-1. Figure 2-1 shows the typical front panel controls associated with the 6001. For a description of controls common to overall Series 626 operation, refer to Volume 1 (Operator's Manual) of the Series 626 Mainframe Manual.

2.3.2 Selecting the Voltage Range

One of three ranges may be selected which effectively defines the maximum or full scale input voltage. For example, for a RANGE F.S. of 200V, the low limit value may range from 20-199 VAC; the upper limit may range from 21-200 VAC.

Table 2-1. 6001 Plug-In Operating Controls

Item	Function
RANGE key and indicator	When indicator lights, user is cued to depress RANGE key and ENTER RANGE F.S. value via numeric keyboard. Printer will prompt values to choose from.
LO LIMIT key	When depressed, enables numeric keyboard to program low limit voltage.
HI LIMIT key	When depressed, enables numeric keyboard to program high limit voltage.
SENS key	When depressed, enables numeric keyboard to program voltage sensitivity value.
IMP SENS key	When depressed, enables numeric keyboard to program impulse voltage sensitivity value.
F SENS	When depressed, enables numeric keyboard to program frequency sensitivity value.
ENTER pushbutton	When depressed, transfers numeric keyboard value into the 6001 memory.

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2.2.3 Installation Guidelines

Proper monitoring and analysis of AC and DC voltage disturbances requires careful attention to the method of connection between the Series 626 Universal Disturbance Analyzer and the monitored circuit. To obtain the most accurate and relevant voltage monitoring data, the following suggested guidelines should be utilized.

1. To minimize spurious impulse transients and interchannel coupling, always use the Dranetz test cables supplied with the 626. If cables are not supplied, such as with the barrier strip input modules, the test cable should be composed of twisted-pair wires for each input channel.

2. Test cable length should be minimized, preferably less than 8 feet from the Series 626 to the circuit connection point. This will minimize amplitude variation of impulse transients.

3. If monitoring a power line connected to critical, sensitive load equipment, the test cable should be connected to the power line as close as possible to the load. For three-phase loads, the 626 should be connected in the same way as the load equipment, i.e. Phase to Phase or Phase to Neutral.

4. Use of instrument-grade potential transformers for monitoring impulses on high voltage power lines is not recommended. The limited frequency response of most potential transformers may result in substantial variation of impulse amplitude.

5. The Series 626 is designed to operate from disturbed power lines. Therefore, the 626 power supply may be connected to the same power source line that is being monitored. However, the user should be aware that the extensive transient suppression incorporated with the 626 power supply may alter the transient characteristics of the AC power line to which the power supply is connected. If the user wishes to prevent alteration of the transient characteristics of the power line being monitored, the 626 power supply input should be separated from the monitored inputs.

6. The ground terminals of the plug-in modules are connected internally to the safety grounding conductor in the 626 power plug. Be careful not to inadvertently contaminate a "clean" ground with a "dirty" ground.

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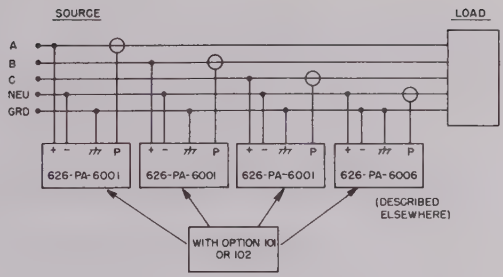

3 Phase Wye

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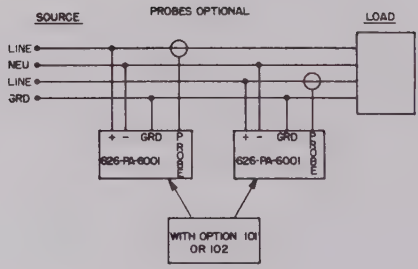
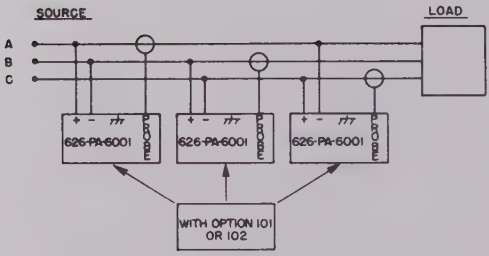


120V/240V Split Phase



3 Phase Delta

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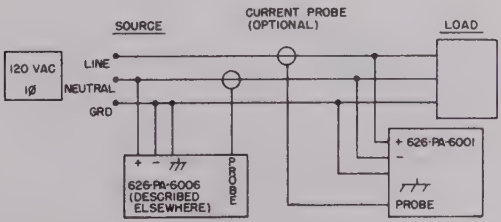
2.2.2 Circuit Applications

WARNING

Connection should be performed only by qualified personnel. Conductors connecting to measurement points should be approved for the specific use. When connected to branch circuits of 20 amperes or less, minimum flexible cord size is No. 18 (1 mm²). For branch circuits with higher ampacity, refer to National Electric Code (ANSI CI-1975 Para. 2404-4 and Para. 250-95). Special consideration of ground may be required. Refer to Article 250 of above reference if in doubt. Outside U.S.A. consult applicable safety standards.

The single phase AC minitor is commonly used alone to monitor a single AC phase, line-to-neutral; or in multiples, to monitor 3Ø or split-phase sources. Note that the plug-in monitors only the voltage difference between its + or - inputs, with the ⏚ input acting only as a common grounding point. The ⏚ input is tied to the safety grounding conductor in the 626 power plug, so be careful not to inadvertently contaminate a "clean" computer power ground with a "dirty" building ground.

The single phase AC monitor is frequently used with the built-in impulse duration/direction option. This application is illustrated on the following pages.



120 VAC Single Phase Connections

Note

Current probes are included with option 101 or 102 for 626-PA-6001.

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NOTE

When selecting modules for installation into any Series 626 Mainframe, verify that the sum of the load ratings of the installed modules DOES NOT exceed 20.

2.2 CONNECTING POWER SOURCE TO MODULE

2.2.1 Connection Procedure

The 6001 plug-in is supplied with either a barrier type terminal strip under a small cover or with an AC connector located at the rear of the module. Proceed as follows:

a. Insert key in FUNCTION key switch on front panel of mainframe and set switch to OFF position.

b. Turn off AC power to the line that is to be monitored.

c. If a terminal strip is mounted on the rear panel of the 6001, remove the terminal strip safety cover to expose the connections. Now connect the single phase line to the three terminals (two AC leads to upper two terminals and earth ground to the third terminal, as marked). When all connections have been made, be sure to replace the terminal block cover, then reapply AC power.

d. If a connector is installed on the rear panel of the 6001, the AC source to be monitored should be wired to the cable assembly supplied with the module. If the supplied cable is not adequate, the mating connector can be obtained from AMP, Inc. The part numbers are as follows:

Part Number	Description
1-480700-0	Connector Housing
1-640720-0	Strain Relief
350689-1	Socket Contacts

Attach the wired mating connector to the rear panel connector then reapply AC power.

CAUTION

To avoid damaging the equipment, do not apply AC 600V RMS voltages in excess of 600V RMS to the 6001.

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SECTION II

INSTALLATION AND OPERATION

2.1 INSTALLATION

To install the 6001 plug-in into the mainframe, proceed as follows:

CAUTION: Be sure the Series 626 Mainframe and all of the power connected to its modules is turned off.

a. Position the top and bottom front corners of the plug-in module into the upper and lower tracks at the desired slot position at the rear of the Series 626 Mainframe.

b. Carefully slide the module into the mainframe until it is firmly in position.

c. Tighten the top and bottom captive screws to secure the module to the mainframe.

2.1.1 LOAD RATINGS

The Series 626 standard mainframe has an upper limit of the combined total rating of the installed modules. The overall mainframe capacity is set at 20 units, and individual modules have load ratings as follows:

Plug-in	Load Rating
626-PA-6001	2 Units
626-PA-6001 with Extra Option Board	3 Units
626-PA-6002	2 Units
626-PA-6003	4 Units
626-PA-6005	2 Units
626-PA-6006	2 Units
626-PA-6007	1 Unit
626-PA-6008	2 Units
626-PA-6009	4 Units
626-PA-6011	1 Unit
626-PA-6012	2 Units
626-PA-60012A	3 Units
626-PA-6013	2 Units
626-PA-6014	1 Unit
626-PA-6015	4 Units
626-PA-6018	4 Units
626-PA-6020	4 Units

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1.7 OPTIONAL ACCESSORIES

Part No.	Quantity	Description
TM-106705U, Volume 2	1	Service (Maintenance) Manual
110481-G2	1	AC Cable with clip leads

Plug-in Configurations

626-PA-6001-1	60 Hz calibration with barrier strip inputs
626-PA-6001-2	60 Hz calibration with connector inputs
626-PA-6001-3	50 Hz calibration with barrier strip inputs
626-PA-6001-4	50 Hz calibration with connector inputs

1.8 FACTORY REPAIR

When factory repair is required, proceed as follows:

1. Contact the Dranetz Service Corporation (formerly Dranetz Technologies, Inc., Customer Service Department) in order to obtain an Authorization Number for factory repair.

   Telephone No. (201) 755-7081

   TWX: (710) 997-9553

   Telex: 499-7808

   Cable: DRANETZ

2. Fill out the REPAIR/SERVICE ORDER form enclosed in the Series 626 Mainframe Operating Manual. Ship it along with the malfunctioning equipment to the Dranetz Service Corporation.

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Table 1-1. 626-PA-6001 Technical Specifications (Cont'd.)

Impulse Thresholds (1V Increments)	
200V F.S. Range	25 - 1000V
400V F.S. Range	50 - 2000V
600V F.S. Range	100- 4000V
Impulse Accuracy	±5% of reading ±1% F.S. for half-sinewave impulses 10 uSec in duration regardless of polarity or grounding. Error increases to ±10% of reading, ±1% F.S. at 5 uSec and 50 uSec pulse durations, and is -6 dB typ. at 2 mSec and 1 uSec pulse widths
Line Frequency	
Range	45 - 65 Hz
Resolution	±0.1 Hz
Accuracy	±0.2 Hz
Program Limits	.2 Hz to 3.0 Hz (.1 Hz Increments)

1.6 STANDARD ACCESSORIES

Model No.	Part No.	Quantity	Description
626PA-6001-1 (-3)	TM-106705U Vol 1	1	Operator's Manual
626PA-6001-2 (-4)	TM-106705U Vol 1	1	Operator's Manual
	110480-G1	1	AC Cable with tinned leads

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Table 1-1. 626-PA-6001 Technical Specifications

Input	2 wire differential Z_{in} = 40 Megohms plus 40 pf (each side to ground)
Full Scale Input Voltage Ranges	200V F.S. 400V F.S. 600V F.S.
Input Voltage Frequency	45 - 65 Hz
Overall Input Voltage Ranges	20 - 200 VAC 40 - 400 VAC 80 - 600 VAC
Lower Limit of User-Set Voltage (1V Increments)	200V F.S. Range 20 - 199 VAC 400V F.S. Range 40 - 398 VAC 600V F.S. Range 80 - 596 VAC
Upper Limit of User-set Voltage	200V F.S. Range 21 - 200 VAC 400V F.S. Range 42 - 400 VAC 600V F.S. Range 84 - 600 VAC
Voltage Change Sensitivity (1V Increments)	
200V F.S. Range	1 - 15 volts
400V F.S. Range	2 - 30 volts
600V F.S. Range	4 - 60 volts
Line Voltage Measurement Accuracy	±1% of reading, ±0.2% of full scale at calibration frequency of 50 or 60 Hz. Additional ±1% at frequency extremes.
Line Voltage Measurement Resolution	
200V F.S. Range	0.2 Vrms
400V F.S. Range	0.4 Vrms
600V F.S. Range	0.8 Vrms
Impulse Ranges (2 mSec to 1 uSec)	
200V F.S. Range	25 - 1000V
400V F.S. Range	50 - 2000V
600V F.S. Range	100- 4000V

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disturbances occur. In an alternate mode, a disturbance data summary printout occurs only at the end of each day. This feature permits long term unattended operation.

The threshold program may be easily altered, using the front panel switches. Cueing indicators adjacent to the programming switches simplify the programming procedure. A back-up program for the plug-in, stored in hard memory at the factory, may always be recalled upon operator demand. Both the program and the disturbance data in the data accumulators may be printed out upon demand.

1.4 APPLICATIONS

When installed in the 626 mainframe, the 6001 provides the capability of monitoring and evaluating power system performance. Among its typical applications are the following:

a. To determine the effect of power systems operation on equipment malfunction. The time-referenced power fault disturbance record produced by the instrument permits rapid correlation of errors, outages, and equipment damage in computer, industrial process controls, digital communications equipment, medical monitoring apparatus, and so forth, to power line faults.

b. To perform pre-installation site surveys. The 6001 can be used to determine the adequacy of existing power lines intended to support critical electrical equipment. Anticipation of power problems saves time, money, and future trouble.

c. For diagnostic evaluation of power system performance. The portable instrument, particularly well suited for field use, is ideal for determining the probable causes of, and remedies for, power line disturbances.

d. For monitoring life test racks. The printout produced by the instrument provides a clear record of the quality of power supplied during unattended periods.

1.5 EQUIPMENT CHARACTERISTICS

The 6001 is configured as a plug-in module 6.5" high by 1.25" wide x 10" deep. It is designed for installation in any one of the five slots of the Series 626 Universal Disturbance Analyzer. Technical specifications of the 6001 are presented in Table 1-1.

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VOLUME 1
OPERATOR'S MANUAL

626-PA-6001 SINGLE PHASE AC MONITOR

SECTION I
GENERAL INFORMATION

1.1 SCOPE

This manual consists of two volumes. Volume 1, the Operator's manual, is divided into three sections: I) GENERAL INFORMATION, II) INSTALLATION AND OPERATION, and III) OPERATIONAL TEST. Volume 2, the Service manual, contains the maintenance instructions and consists of four sections, IV through VII. (See Volume 2 for a description of these sections.)

1.2 INTRODUCTION

This manual provides the operating instructions for the 626-PA-6001 Single Phase AC Monitor plug-in, hereinafter referred to as the 6001 plug-in. The 6001 plug-in is designed for installation into the Series 626 Universal Disturbance Analyzer Mainframe, referred to as the Series 626. Before reading these instructions, read the mainframe information described in Volume 1 of the Mainframe manual.

1.3 PURPOSE

The 6001 plug-in is designed to monitor single phase AC power lines. With thresholds programmed by the user, the 6001 monitors both short and long term power line disturbances. With this plug-in, the unit stores, analyzes, classifies and prints out quantative and qualitative disturbance data. Accompanying the data is a printout of time derived from a highly accurate crystal-controlled 24-hour clock in the mainframe.

The plug-in monitors any single phase power line whose RMS values range from a low value of 20 volts to as high as 600 volts, programmable in three broad ranges. Three types of disturbances are monitored by the 6001: power line frequency, power frequency transients and waveform disturbances. Power frequency transients are divided into five display categories: overvoltage, undervoltage, voltage change, voltage surge and voltage sag. Waveform disturbances, identified as "impulses," include all conditions that cause the power line waveform to deviate from an ideal waveform. The 6001 measures both the peak amplitude of impulses and their polarity. When equipped with an option board, the 6001 also measures pulse duration and direction or pulse area and direction. The threshold value of each type of disturbance, as well as the line frequency, above which detection and printout occurs, is operator programmable. Except for an automatic summary printout at the end of each day, disturbance data is normally printed out only when the

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STATEMENT OF WARRANTY

ALL PRODUCTS OF DRANETZ TECHNOLOGIES, INC. ARE WARRANTED TO THE ORIGINAL PURCHASER AGAINST DEFECTIVE MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM THE DATE OF DELIVERY. DRANETZ WILL REPAIR OR REPLACE, AT ITS OPTION, ALL DEFECTIVE EQUIPMENT RETURNED, FREIGHT PREPAID, DURING THE WARRANTY PERIOD, WITHOUT CHARGE FOR REPAIR, PROVIDED THERE IS NO EVIDENCE THAT THE EQUIPMENT HAS BEEN MIS-HANDLED OR ABUSED.

NOTE

The information in this manual has been reviewed and is believed to be entirely reliable. However, no responsibility is assumed for any inaccuracies. The material in this manual is for information purposes only, and is subject to change without notice.

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WARNING

Because of possible shock or fire hazards, connection of this instrument should be performed in compliance with the National Electrical Code (ANSI C1) and/or any other requirements which may be applicable to the user.

Installation, operation, and maintenance should be performed only by qualified personnel.

TM-106705U

VOLUME 1

OPERATOR'S MANUAL

626-PA-6001

SINGLE PHASE AC MONITOR

NOTE

Refer to Volume 2 (Service Manual) of TM-110650U for maintenance data.

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